

$$\sqrt{9p^{12}q^6}$$

$$3p^4q^3$$

$$54. \quad -\sqrt{\frac{x^2+4x+4}{(x+2)^2}}$$

$$-(x+2)$$

## 5.6 Radical Expressions

### Properties

$$a, b, \sqrt[n]{a}, \sqrt[n]{b} \in \mathcal{R}$$

$$m, n \in \mathbb{Z}$$

$$1. \sqrt[n]{ab} = \sqrt[n]{a} \cdot \sqrt[n]{b}$$

$$2. \sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$$

$$3. \sqrt[n]{b^m} = (\sqrt[n]{b})^m$$

$$4. \sqrt[m]{\sqrt[n]{b}} = \sqrt[mn]{b} = \sqrt[n]{\sqrt[m]{b}}$$

Ex:

$$\sqrt{36} = \sqrt{9} \cdot \sqrt{4} = 3 \cdot 2 = 6$$

$$\sqrt[4]{4^3} = (\sqrt[4]{4})^3 = 2^3 = 8$$

$$\sqrt[8]{16} = \sqrt[4]{4} = \sqrt{\sqrt{4}} = \sqrt{2}$$

Ex:

$$\sqrt[3]{8^2} = (\sqrt[3]{8})^2 = 2^2 = 4$$

$$\sqrt[3]{216} = \sqrt[3]{8} \sqrt[3]{27} = 6$$

$$\sqrt[6]{64} = \sqrt[3]{16} = \sqrt[3]{8} = 2$$

$$\sqrt[6]{64} = \sqrt[3]{4} = 2$$

Ex:

$$\sqrt[15]{32} = \sqrt[5]{\sqrt[3]{32}} = \sqrt[5]{2}$$

$$\sqrt{\frac{7}{4}} = \frac{\sqrt{7}}{\sqrt{4}} = \frac{\sqrt{7}}{2}$$

Rationalize the Denominator  
(free of irrational numbers)

$$\sqrt{\frac{7}{3}} = \frac{\sqrt{7}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{21}}{3}$$

$$\frac{9}{\sqrt{b^3}} = \frac{9}{b\sqrt{b}} \cdot \frac{\sqrt{b}}{\sqrt{b}} = \frac{9\sqrt{b}}{b\sqrt{b^2}} = \frac{9\sqrt{b}}{b^2}$$

$$\frac{4}{\sqrt[4]{27a^2}} = \frac{4}{\sqrt[4]{3^3 a^2}} \cdot \frac{\sqrt[4]{3a^2}}{\sqrt[4]{3a^2}} = \frac{4\sqrt[4]{3a^2}}{3a}$$

$$\frac{2}{\sqrt[5]{2c^4}} \cdot \frac{\sqrt[5]{2^4c} \cdot \sqrt[5]{16c}}{\sqrt[5]{2^4c}} = \frac{\sqrt[5]{2^5c^5}}{\sqrt[5]{2^4c}}$$

$$\frac{\cancel{\sqrt[5]{16c}}}{\cancel{2c}} = \frac{\sqrt[5]{16c}}{c}$$

$$\frac{1}{\sqrt[5]{a^2b^3c}} \cdot \frac{\sqrt[5]{a^3b^2c^4}}{\sqrt[5]{a^3b^2c^4}} = \frac{\sqrt[5]{a^3b^2c^4}}{\sqrt[5]{a^3b^2c^4} \cdot abc}$$

$$\frac{8}{\sqrt[3]{32ab^2c^6}}$$

$$\frac{1}{\sqrt[3]{48}}$$

Operations (combine like terms)

ex:

$$\sqrt{50} - 3\sqrt{72} + \sqrt[3]{8}$$

$$5\sqrt{2} - 18\sqrt{2} + 2$$

$$\boxed{-13\sqrt{2} + 2}$$

ex:

$$\sqrt{8} + \sqrt{98}$$

ex:

$$\sqrt[3]{81} - \sqrt{24}$$

$$3\sqrt[3]{3} - 2\sqrt{3}$$

$$\boxed{\sqrt[3]{3}}$$

$$\begin{array}{c} \wedge \\ 9 \quad 9 \\ 3 \quad 3 \quad 3 \quad 3 \end{array}$$

$$\begin{array}{c} 24 \\ \wedge \quad \wedge \\ 6 \quad 4 \\ \wedge \quad \wedge \quad \wedge \\ 3 \quad 2 \quad 2 \quad 2 \end{array}$$

ex:

$$(\sqrt{3} - \sqrt{5})^2$$

ex:

$$(\sqrt{7} - \sqrt{11})(\sqrt{7} + \sqrt{11})$$

ex:

$$\frac{1}{(3 + \sqrt{2})} \cdot \frac{(3 - \sqrt{2})}{(3 - \sqrt{2})} = \boxed{\frac{3 - \sqrt{2}}{7}}$$

Conjugates  $^{\pi} - 3\sqrt{2} + 3\sqrt{2} - 2$

ex: Conjugates  $a + b$  and  $a - b$ 

$$\frac{8}{4 - \sqrt{5}}$$

ex:

$$\frac{3 + \sqrt{7}}{5 - 2\sqrt{7}}$$

ex:

$$\frac{\sqrt{6}}{5 + \sqrt{3}}$$

Fun with Factoring 😊

ex:

$$x^2 - 18$$

ex:

$$x^2 - 12$$

ex:

$$x^3 - 5$$

ex:

$$x^2 + x 2\sqrt{3} + 3$$

HW

p254 15-45 odd